

coronary arteriovenous lactate and pyruvate differences were, in turn, closely and directly correlated with the respective arterial blood levels.

The mean myocardial lactate utilization was 7.5 mg. per 100 Gm. of heart muscle per minute, and pyruvate utilization was 1.1 mg., with a mean myocardial oxygen consumption of 12 cc./100 Gm./min. Assuming complete oxidation of lactate and pyruvate in the heart, the amounts removed could together account for anything up to 80 per cent of the current myocardial oxygen consumption, this percentage depending in the normal almost entirely upon the arterial levels of each metabolite. No myocardial glucose utilization was demonstrable and no ketone body utilization was found at normal levels. In hyperglycemia from glucose infusion, lactate and pyruvate blood levels rose but with the same myocardial lactate and pyruvate utilization compared to their arterial levels as was found in normals.

Lactate and pyruvate thus appear to be preferred sources of energy for the myocardium and are increasingly utilized as their arterial levels and the coronary blood flow rise. Glucose, even when present in excess, apparently does not compete with lactate or pyruvate for myocardial utilization. These facts may help to explain logically the excellent adaptation of the heart to stress or to the increased work of severe exercise.

**ELECTROLYTE CHANGES IN CONGESTIVE HEART FAILURE: EFFECTS OF ADMINISTRATION OF POTASSIUM AND SODIUM SALTS.** *Charles L. Fox, Jr., M.D., Charles K. Friedberg, M.D. and Abraham G. White, M.D. (by invitation), New York, New York.* (From the Department of Bacteriology, College of Physicians and Surgeons, Columbia University and the Medical Service, Mt. Sinai Hospital.)

The electrolyte pattern of the plasma, edema fluid and urine during acute congestive heart failure and after recovery was investigated together with the effects of administering various mixtures of potassium and sodium salts.

With chronic congestive heart failure, the plasma sodium was subnormal (112 to 132 mEq. per L.) in nineteen patients; two patients had high values (148 and 150); five patients ranged from 133 to 142. Plasma chlorides did not

parallel sodium; they were reduced in nine patients (93 to 101 mEq. per L.) and elevated in twelve patients (106 to 112 mEq. per L.) with four in the normal range (101 to 106 mEq. per L.). Plasma potassium was subnormal in ten (2.3 to 3.5), above normal in three (5.4, 5.8 and 7.3) and normal (4 to 5) in six. After recovery from failure measurements were repeated in five patients and plasma sodium increased from 4 to 15 mEq.; plasma potassium when subnormal also increased (3.0 and 3.2 going to 5.0 and 5.2, respectively).

After injection of a mercurial diuretic but before the onset of diuresis, changes in the electrolyte composition of the edema fluid were observed. With diuresis, marked changes in the electrolyte pattern of the urine resulted. The administration of NaCl or KCl resulted in positive chloride balances and weight gain. When these cations were given with organic anions, little or no weight gain occurred despite the markedly positive sodium balance. Simultaneous administration of K acetate and NaCl diminished the weight gain and positive chloride balance.

In these studies gain or loss of weight did not appear to be a simple function of sodium balance. The observations suggest that intracellular and extracellular ionic relationships may play a part in the phenomena of congestive heart failure.

**LIFE SITUATIONS, EMOTIONS AND HUMAN COLONIC FUNCTION.** *William J. Grace, M.D., Stewart Wolf, M.D. and Harold G. Wolff, M.D. (by invitation), New York, New York.* (From the Departments of Medicine and Psychiatry of the New York Hospital and Cornell University Medical College.)

We have had a unique opportunity to study the behavior of the human colon in two fistulous subjects, with particular emphasis on the influence of emotions and feeling states. Subject A had a large prolapse of the ascending colon and cecum through a cecostomy wound. Subject B had a large prolapse of the descending colon and sigmoid through a colostomy incision.

Our findings indicate that situations productive of anger, guilt, resentment and hostility are accompanied by hyperfunction of the large bowel. This hyperfunction is manifested by an increase in motor activity, blood flow,

lysozyme production and usually mucus secretion. In severe induced pain under experimental circumstances there was intense fear and fright and a pallor and relaxation of the large intestine. Increase in motor activity, blood flow and secretion of the large bowel occurred regularly following ingestion of an average meal. However, in one of our subjects little change in activity was noted when he was in a period of low spirits, dejection and mild depression. Other threats to bodily and personal integrity, such as sigmoidoscopic examination, personality study and having the patient perform a psychometric test, resulted in an increase in motor activity and blood flow. A period of sustained anger, resentment and hostility resulted in a profuse eruption of petechiae throughout the surface of the exposed colon.

**COMPARATIVE STUDY OF THE EFFECTS OF MILK AND HYDROLYZED PROTEIN ON GASTRIC AND DUODENAL BULB ACTIVITY IN DUODENAL ULCER.** *Mieczyslaw S. Lopusniak, M.D. (introduced by Irwin J. Pincus, M.D.), Philadelphia, Pennsylvania.* (From the Graduate Hospital of the University of Pennsylvania.)

The studies on which this report are based were undertaken: (1) to observe the effects of an aqueous mixture of casein hydrolysate, dextrans and maltose on the acidity of the contents of both the duodenal bulb and pars pylorica in patients with active duodenal ulcer and (2) to compare these effects with those of milk and a mixture of milk and cream. Eleven patients with clinical and roentgenologic evidence of active duodenal ulcer were selected for study. The amount of each foodstuff and the frequency of administration were so chosen as to duplicate clinical methods of treating ulcers which utilize these substances. Material was extracted by means of a special double-lumen tube from either side of the pylorus before and at intervals after the feeding of each of the substances under investigation.

It was found that casein hydrolysate more effectively buffered and neutralized gastric and duodenal bulb acidity over a two-hour period than did an equal quantity of milk or a mixture

of milk and cream fed hourly over the same period. Under the experimental circumstances of the study and on the basis of the criteria used the hydrolyzed protein mixture employed was, nevertheless, an imperfect buffer and neutralizer of gastric and duodenal bulb acidity in these duodenal ulcer patients. Fairly marked secondary stimulation of active secretion in the stomach regularly followed its ingestion.

**STUDIES IN PULMONARY FUNCTION BEFORE AND AFTER PULMONARY RESECTION FOR BRONCHIECTASIS AND OTHER PULMONARY DISEASE.** *Joan H. Long, M.D., W. Emory Burnett, M.D., Charles M. Norris, M.D. and M. R. Wester, M.S. (introduced by Thomas M. Durant, M.D.), Philadelphia, Pennsylvania.*

By means of external spirometry and bronchospirometry, changes in the volume of air moved and in oxygen absorption after the surgical removal of one or more pulmonary segments have been studied in sixty-four patients with bronchiectasis and in five patients with other pulmonary disease. Studies were done pre-operatively two weeks postoperatively and again six months to two years later.

It was found that in unilateral bronchiectasis the oxygen absorption is reduced more than the volume of air moved on the affected side. The maximum breathing capacity during voluntary effort is reduced in a manner roughly proportional to the extent of the disease. This decrease is due in most instances to a decrease in the depth of respiration during this effort. After the resection of one or more pulmonary segments the voluntary maximum breathing capacity may be increased.

Only occasionally is there an increase in the percentage of the total air moved by the remaining lung segment on the operated side; usually there is no change or a decrease of the percentage of air moved by that side. On the other hand, it is a little more common to find an increase in the percentage of the total oxygen absorbed by the remaining lung segment on the operated side although, again, in the majority of cases there is either no change or a decrease in this function.